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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/963,924	09/26/2001	Yoshikazu Kasuya	15.49/6067	1276

24033 7590 05/19/2003

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EXAMINER

RAO, SHRINIVAS H

ART UNIT PAPER NUMBER

2814

DATE MAILED: 05/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/963,924

Applicant(s)

KASUYA, YOSHIKAZU

Examiner

Steven H. Rao

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 October 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21, 22-26 is/are pending in the application.
- 4a) Of the above claim(s) 18 and 19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-21, 22 to 26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) 1-21 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☒ Interview Summary (PTO-413) Paper No(s). 12
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 11 6) ☐ Other:

Response to Amendment

Applicants' amendment filed on 2/24 /2003 has been entered on March 05, 2003. Therefore claims 1, 3 and 5 to 17 as amended by the amendment and claims 22 to 26 presently newly added and claim 4 as originally filed are currently pending in the application.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-17 and 21-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Misra , (U.S. Patent No. 5,960,270, herein after Misra), previously applied for reasons previously set out (and reproduced below for ready reference) and those stated below. (see also response to arguments section below).

With respect to claim 1, Misra describes a method of manufacturing a semiconductor device including the steps of : forming a gate dielectric layer (fig. 10 # 105), forming a first conductive layer having a specified pattern on the gate dielectric layer (Fig. 11 # 108), forming a first upper layer comprising a material different from the first conductive layer on the first conductive layer (fig. 11 # 110), forming a second upper layer comprising a material different from the first upper layer on the first upper layer (fig. 14 # 120) forming sidewall spacers on side walls of the first conductive layer, the first upper layer and the second upper layer (Fig. 14 # 114), forming an insulating

layer that covers the second upper layer and the side wall spacers (Fig. 14 # 122), planarizing the insulation layer until an upper surface of the first conduction layer is exposed (fig. 15, planarize 122) , remove the second upper layer (fig. 15) removing the first upper layer to form a recessed section between the sidewall spacers (fig. 16), forming a second conductive layer in the recessed section to form a gate electrode that includes at least the first conductive layer and the second conductive layer (fig. 17 # 128) It is noted that the figs. 19-22 show a second embodiment, however as stated in col. 10 lines 37-39, the steps describing the embodiment in figs. 10-16 are also used in the embodiment described in figs. 19-22 filling a second conduction layer in the recessed section to form a gate electrode that includes at least the first conduction layer and the second conduction layer.

It is noted that Misra does not describe the forming the upper layers and the sidewall spacers in the same sequence as recited in the claims, however it is noted that applicants' use the term " comprising" which does not exclude other sequences and further it is well settled that , " As a matter of fact selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results." In re Burhaus, 154 F.2d 690, 69 USPQ 330 (CCPA 1946) and also Ex parte Rubin, 1126 USPQ 440 (BAPI 1959).

Therefore the teachings of Misra are prima facie obvious even if the steps are performed in different sequence without a showing of new or unexpected results.

With respect to claim 2, wherein step (h) is conducted by an etching method (Misra col. 9 lines 60-67) and in the step (h), a ratio of an etching rate of the second

conductive layer with respect to an etching rate of the first upper layer is two or greater. (It is an inherent property that the etching rate of Misra's polysilicon layer 128 with respect to Misra's nitride layer 120 is two or greater as the etching rate of a particular material for a particular etchant is an inherent property of that material and as the same materials are used in the Misra reference as that used by applicants' in their specification page e.g. 11-12 and whatever inherent properties is inherent to the materials used by applicants is also true (inherent) for the same materials in the same situation for the Misra reference also).

With respect to claim 3, wherein the step (i) is conducted by an etching method, and in step (i) a ratio of an etching rate of the first upper layer with respect to an etching rate of the first conductive layer is two or greater. (It is an inherent property that the etching rate of Misra's nitride layer 120 with respect to the Misra's conductive polysilicon layer 108/128 is two or greater and similar to the description by applicants' in their specification page e.g. 11-12 and further the same arguments as stated under claim 2 above are incorporated here by reference).

With respect to claim 4, wherein the first upper layer is formed from silicon nitride (Misra layer 120 from silicon nitride) and the second upper layer is formed from polysilicon. (Misra layer 108/128, fig. 21 etc.).

With respect to claim 5, wherein after step (i) forming a barrier layer between the first conductive layer and the second conductive layer. (Misra fig. 20, col. 10 lines 39-30, not shown in fig. 20).

With respect to claim 6, after step (i) forming a barrier layer between the first conductive layer and the second conductive layer and forming a barrier layer between the second conduction layer and the sidewall spacers (Fig. 2 C # 60 and Fig. 2D).

With respect to claim 7, Misra describes the method for manufacturing a semiconductor device includes the steps of : forming a gate dielectric layer(Misra fig. 10 # 105), forming a first conductive layer on the gate dielectric layer (Misra Fig. 1 F # 28, col. 6 lines 41-42), forming an upper layer on the first conductive layer, at least a lower portion of the upper layer comprising a material different from at least an upper portion of the first conductive layer (fig. 2b # 32, col. 8 lines 8-10 fig. 2b # 32, col. 8 lines 8-10), forming sidewall spacers on side walls of the first conductive layer and the upper layer (Misra fig. 5), forming an insulation layer that covers the upper layer and the sidewall spacers (fig. 7 # 30), planarizing the insulation layer until an upper surface of the upper layer is exposed (fig. 8), removing the upper layer to form a recessed section between the sidewall spacers on an upper portion of the first conductive layer (fig. 9) and forming the second conductive layer in the recessed section to form a gate electrode that includes at least the first conductive layer and the second conductive layer(fig. 9 # 36).

With respect to claim 8, wherein after step (g) is conducted by an etching method and in step (g), ratio of an etching rate of at least the lower portion of the upper layer with respect to an etching rate of the at least upper portion of the first conductive layer is two or greater. (rejected for reasons stated under claim 2 above) .

With respect to claim 9, wherein the first conductive layer is formed from a poly silicon layer (Misra col.9 line 64).

forming a barrier layer between the first conduction layer and the second conductive layer (Fig. 2 A # 54, col. 7 line 39, col. 8 lines 53-59).

With respect to claim 10, wherein the second conductive layer comprises a material selected from the group consisting of a metal, a metal alloy and a metal compound (Misra layer 128).

With respect to claim 11, wherein after step (g) forming a barrier layer between the first conductive layer and the second conductive layer (rejected for same reasons as stated under claim 5 above).

With respect to claim 12, wherein after step (g) forming a barrier layer between the first conductive layer and the second conductive layer and forming a barrier layer between the second conductive layer and the sidewall spacers (Misra col.9 lines 55-60).

With respect to claim 13, wherein the method of manufacturing a semiconductor device includes the steps of : forming a gate dielectric layer (fig. 10 # 105), forming a first conductive layer on the gate dielectric layer (fig.11 # 108), forming an upper layer on the conductive layer (fig. 12 # 114), forming sidewall spacers on side walls of the first conductive layer and the upper layer (fig. 14 # 120), removing the upper layer to form a recessed section between the sidewall spacers and above at least part of the conductive layer (fig. 16), and forming a second conductive layer in the recessed section to form a gate electrode comprising the at least part of the first conduction layer and the second conduction layer .(fig. 21).

With respect to claim 14, wherein after step (g) forming a barrier layer between the first conductive layer and the second conductive layer (rejected for the same reasons as stated under claim 5 above).

With respect to claim 15, wherein after step (g) forming a barrier layer between the first conductive layer and the second conductive layer and forming a barrier layer between the second conductive layer and the sidewall spacers (rejected for the same reasons as stated under claim 6 above).

With respect to claim 16, wherein the first conductive layer and the second conductive layer comprises materials having different compositions. (rejected for same reasons as stated under claim 4 above).

With respect to claim 17, wherein the first conductive layer comprises polysilicon and the second conductive layer comprises a material selected from the group consisting of a metal, a metal alloy and a metal compound. (Misra fig. 12 # 108 – polysilicon and fig. 19 # 129- metal).

The presently newly added claims are :

With respect to claims 22 to 24 wherein the method for manufacturing a semiconductor device according to claim 1, wherein the second upper layer and the first conductive layer are formed from an identical material. 23. (new) A method for manufacturing a semiconductor device according to claim 1, wherein the second upper layer and the first conductive layer each comprise polysilicon. 24. (new) A method for manufacturing a semiconductor device according to claim 7, further comprising forming the upper layer to include an upper portion, and wherein the upper portion and the first

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conductive layer are formed from an identical material. (Misra fig. 12 # 108 –polysilicon and fig. 19 # 129- metal).

With respect to claim 25 wherein a method for manufacturing a semiconductor device according to claim 14, further comprising: forming the first conductive layer from a material comprising polysilicon, forming the upper layer to include a lower portion formed from silicon nitride and an upper portion formed from polysilicon, and forming the second conductive layer from a material selected from the group consisting of a metal, a metal alloy, and a metal compound. (Misra fig. 12 # 108 –polysilicon and fig. 19 # 129- metal).

With respect to claim 26 wherein a method for manufacturing a semiconductor device according to claim 25, wherein the second conductive layer is formed from at least one material selected from the group consisting of tungsten, aluminum, copper, titanium silicide tungsten silicide cobalt silicide and molybdenum silicide. (Misra claim 34).

Response to Arguments

Applicant's arguments filed 2/24/03 have been fully considered but they are not persuasive for the following reasons :

Applicants' first contention is that Misra does not teach the recited limitation, " forming a second conductive layer in the recessed section to form a gate electrode that includes at least the first conductive layer and the second conductive layer." Is not persuasive because Misra in col. 3 lines 5 to 17 states :

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In addition, the metal gate processes taught herein can form self-aligned MOS transistors which are interconnected at the gate level using a novel dual inlaid process (see FIGS. 8-9). The novel dual inlaid structure has a bottom/lower dual inlaid region which forms the metallic gate electrodes of the MOS transistors (i.e., it does not form inter-metallic interconnects/contacts as are common in the prior art, but forms a gate electrode isolated from electrical contact by a gate dielectric). The dual inlaid structure also has an upper interconnect dual inlaid trench region connected to the underlying dual inlaid gate region for connecting the underlying metallic gate electrode to another active electric device or gate electrode on the integrated circuit (IC).

Further figure 21 of Misra shows the following :

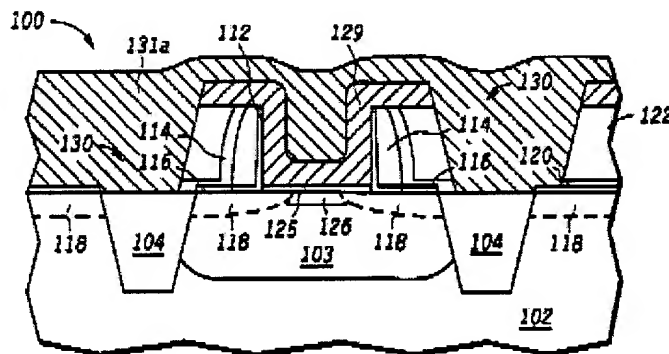


FIG. 21

Therefore Misra shows and describes the recited forming a second conductive layer in the recessed section to form a gate electrode that includes at least the first conductive layer and the second conductive layer.

The same contentions are presented with respect to claims 7 and 13 which are also not persuasive for the reasons set out above.

Dependent claims 2-6, 8-12 and 14-21 were alleged to be allowable at least for their dependency on allegedly allowable claims 1, 7 and 13.

However as shown above claims 1, 7 and 13 are not allowable and therefore claims 2-6, 8-12 and 14-21 are also not allowable.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven H. Rao whose telephone number is (703) 3065945. The examiner can normally be reached on 8.00 to 5.00.


The fax phone numbers for the organization where this application or proceeding is assigned are (703) 746-3926 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 306-7722.


Steven H. Rao

Patent Examiner

May 8, 2003


LONG PHAM
PRIMARY EXAMINER